

We claim:

1. A polymeric PTC composition comprising an organic polymer, a particulate conductive filler; an organic stabilizer including N-N-m phenylenedimaleimide and, optionally, one or more additives selected from the group consisting of inert fillers, flame retardants, stabilizers, antioxidants, antiozonants, accelerators, pigments, foaming agents, crosslinking agents, coupling agents, co-agents and dispersing agents.

2. The composition of Claim 1 wherein said organic stabilizer is present in an amount of between about 0.5 to about 15.0 based on the total composition.

3. The composition of Claim 1 wherein said organic stabilizer is present in an amount of between about 1.0 to about 5.0 based on the total composition.

4. The composition of Claim 1 wherein the particulate conductive filler is selected from the group consisting of carbon black, graphite, metal particles, and mixtures thereof.

5. The composition of Claim 4 wherein the metal particles are selected from the group consisting of nickel particles, silver flakes, or particles of tungsten, molybdenum, gold, platinum, iron, aluminum, copper, tantalum, zinc, cobalt, chromium, lead, titanium, tin alloys, and mixtures thereof.

6. The composition of Claim 1 wherein the inorganic stabilizers are selected from the group consisting of magnesium oxide, zinc oxide, aluminum oxide, titanium oxide, calcium carbonate, magnesium carbonate, alumina trihydrate, magnesium hydroxide, and mixtures thereof.

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7. The composition of Claim 1 wherein the antioxidant comprises a phenol or an aromatic amine.

8. The composition of Claim 7, wherein the antioxidant is selected from the group consisting of N,N'-1,6-hexanediylbis (3,5-bis (1,1-dimethylethyl)-4-hydroxy-benzene) propanamide, (N-stearoyl-4-aminophenol, N-lauroyl-4-aminophenol, polymerized 1,2-dihydro-2,2,4-trimethyl quinoline, and mixtures thereof.

9. The composition of Claim 1 wherein said particulate conductive filler is present in an amount of between about 15.0 phr to 250.0 phr.

10. The composition of Claim 1 wherein said particulate conductive filler is present in an amount of between about 60.0 phr to 180.0 phr.

11. The composition of Claim 1, wherein the polymeric PTC composition is crosslinked with the aid of a chemical agent or by irradiation.

12. The composition of Claim 1 wherein the organic polymer has a melting temperature T_m of about 60°C to about 300°C.

13. The composition of Claim 1, further comprising between about 0.5% to 50.0% of a second crystalline or semi-crystalline polymer based on the total organic polymer component.

14. The composition of Claim 13, wherein the second polymer is selected from a polyolefin thermoplastic elastomer, a polyester thermoplastic elastomer, and mixtures and copolymers thereof.

15. An electrical device which exhibits PTC behavior, comprising:
(a) a conductive polymeric composition that comprises an organic polymer component including perhydrotriphenylene, a particulate conductive filler, and, optionally, one or more additives selected from the group consisting of inert fillers, flame retardants, stabilizers, antioxidants, antiozonants, accelerators, pigments, foaming agents, crosslinking agents and dispersing agents, the composition having a resistivity at 25° C of 100 Ω cm or less, the composition having a resistivity at 25°C of 100 Ω cm or less and a resistivity at its switching temperature that is at least 10^3 times the resistivity at 25°C; and

(b) at least two electrodes which are in electrical contact with the conductive polymeric composition to allow a DC or an AC current to pass through the composition under an applied voltage, wherein the device has a resistance at 25°C of 500 m Ω or less with a desirable design geometry.

16. The device of Claim 15 wherein the device has a resistance at 25°C of about 5.0 m Ω to about 400 m Ω .

17. The device of Claim 16 wherein the device has a resistance at 25°C of about 10 m Ω to about 100 m Ω .

18. The composition of Claim 15 wherein said inert filler is present in an amount of between about 0.25 phr to 50.0 phr.

19. The composition of Claim 15 wherein said inert filler is present in an amount of between about 0.5 phr to 10.0 phr.

20. The composition of Claim 15 wherein the particulate conductive filler is selected from the group consisting of carbon black, graphite, metal particles, and mixtures thereof.

21. The composition of Claim 20 wherein the metal particles are selected from the group consisting of nickel particles, silver flakes, or particles of tungsten, molybdenum, gold, platinum, iron, aluminum, copper, tantalum, zinc, cobalt, chromium, lead, titanium, tin alloys, and mixtures thereof.

22. The composition of Claim 15 wherein the inorganic stabilizers are selected from the group consisting of magnesium oxide, zinc oxide, aluminum oxide, titanium oxide, calcium carbonate, magnesium carbonate, alumina trihydrate, magnesium hydroxide, and mixtures thereof.

23. The composition of Claim 15, wherein the antioxidant is selected from the group consisting of N,N'-1,6-hexanediylbis (3,5-bis (1,1-dimethylethyl)-4-hydroxy-benzene) propanamide, (N-stearoyl-4-aminophenol, N-lauroyl-4-aminophenol, polymerized 1,2-dihydro-2,2,4-trimethyl quinoline, and mixtures thereof.

24. The composition of Claim 15 wherein said particulate conductive filler is present in an amount of between about 15.0 phr to 250.0 phr.

25. The composition of Claim 15 wherein said particulate conductive filler is present in an amount of between about 60.0 phr to 180.0 phr.

26. The composition of Claim 15, wherein the polymeric PTC composition is crosslinked with the aid of a chemical agent or by irradiation.

28. The composition of Claim 15, further comprising between about 0.5% to 50.0% of a second crystalline or semi-crystalline polymer based on the total organic polymer component.

27. The composition of Claim 15 wherein the organic polymer has a melting temperature T_m of about 60°C to about 300°C.

29. The composition of Claim 28, wherein the second polymer is selected from a polyolefin thermoplastic elastomer, a polyester thermoplastic elastomer, and mixtures and copolymers thereof.